

研究论文

抗氧化剂亚硫酸钠、亚硫酸氢钠及焦亚硫酸钠氧化反应速率常数的测定

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摘要 为评价抗氧化剂的抗氧化能力, 测定了抗氧化剂亚硫酸钠、亚硫酸氢钠及焦亚硫酸钠在水溶液中与氧反应的速率常数. 在溶液中连续通入足量的氧气, 维持溶解氧浓度恒定. 用碘量法测定亚硫酸钠、亚硫酸氢钠及焦亚硫酸钠在水溶液中不同时刻的浓度, 用氧电极测定溶液中溶解氧的浓度, 作出亚硫酸钠、亚硫酸氢钠及焦亚硫酸钠的降解曲线, 计算亚硫酸钠、亚硫酸氢钠及焦亚硫酸钠氧化反应速率常数. 结果表明, 亚硫酸钠、亚硫酸氢钠及焦亚硫酸钠在水溶液中与氧的反应均为零级反应. 由于在溶液中这三种抗氧化剂存在解离平衡, 当溶液的pH值相同时这三种抗氧化剂实质上是一样的, 其平均表观反应速率常数在25 °C温度和pH 6.8, 4.0及9.2条件下分别为 $(1.34 \pm 0.03) \times 10^{-3}$, $(1.20 \pm 0.02) \times 10^{-3}$ 和 $(6.58 \pm 0.02) \times 10^{-3} \text{ mol} \cdot \text{L}^{-1} \cdot \text{h}^{-1}$.

关键词 [药物稳定性](#) [氧](#) [氧化反应速率常数](#) [抗氧化剂](#) [亚硫酸钠](#) [亚硫酸氢钠](#) [焦亚硫酸钠](#)

分类号

Determination of Oxidation Rate Constants of Antioxidants Sodium Sulfite, Sodium Bisulfite and Sodium Pyrosulfite

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Abstract To evaluate the antioxygenic property of the antioxidants, the oxidation reaction rate constants of sodium sulfite, sodium bisulfite and sodium pyrosulfite in aqueous solutions were determined. In the experiments, sufficient air was continually inflated into the solution to keep the concentration of dissolved oxygen constant. The residual concentrations of sodium sulfite, sodium bisulfite or sodium pyrosulfite in the solution were respectively determined by iodimetry, and the concentration of dissolved oxygen by oxygen electrode. The data were fitted by linear regressions to obtain the reaction rate constants. It was found that the degradation of sodium sulfite, sodium bisulfite or sodium pyrosulfite obeyed the zero-order kinetics in the buffer solutions. Because of the ionization equilibrium, the same ions were formed when the three antioxidants respectively dissolved in aqueous solutions of definite pH values, and therefore their apparent rate constants were essentially the same. The average apparent rate constants of the three antioxidants at 25 °C are $(1.34 \pm 0.03) \times 10^{-3} \text{ mol} \cdot \text{L}^{-1} \cdot \text{h}^{-1}$ at pH 6.8, $(1.20 \pm 0.02) \times 10^{-3} \text{ mol} \cdot \text{L}^{-1} \cdot \text{h}^{-1}$ at pH 4.0 and $(6.58 \pm 0.02) \times 10^{-3} \text{ mol} \cdot \text{L}^{-1} \cdot \text{h}^{-1}$ at pH 9.2, respectively.

Key words [drug stability](#) [oxygen](#) [oxidation rate constant](#) [antioxidant](#) [sodium sulfite](#) [sodium bisulfite](#) [sodium pyrosulfite](#)

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